TITLE

Feedback management for hearing aid

BACKGROUND OF THE INVENTION

The present invention relates to a method of managing acoustic feedback in hearing aids. Feedback is a problem, which occurs in a hearing aid when the acoustic output signal from the hearing aid propagates beside an ear mould or through a vent and consequently enter the hearing aid microphone as an acoustic input. The hereby closed acoustic loop will especially for frequencies above 1-2 kHz often cause the hearing aid to howl, which disables the function of the hearing aid.

During time several attempts have been made to avoid or to reduce the feedback problems of hearing aids. Previously known methods comprise the use of a high frequency cut-off filter to reduce the gain for the feedback management. This method can have the form of an isolated filter to be individually adjusted, but suffer from a drawback in that when the volume control of the hearing aid is turned down and hereby reduces the gain of the feedback frequencies, the filter is still in action reducing the high frequency gain. Another known method comprises a combination of the volume control and a high frequency cut-off filter meaning that when the volume control is turned up and hereby increases the gain of the hearing aid, the filter goes gradually into action and reduces the high frequency gain. The drawbacks of this scheme being that until now this could not be individually adjusted and secondly that the steepness of this filter was a modest 6 dB/octave.

The objective of the present invention is to provide a method for feedback management, which reduces the feedback problems without the previously mentioned drawbacks.

SUMMARY OF THE INVENTION

The objective of the invention is achieved by a method, which is characterised by:

- using a multi (two or more) channel type of filter hereby splitting the frequency range up in two or more separate parts
- determining the maximum allowable gain in at least one frequency range before feedback occurs
- monitoring the volume control in such a way, that if the maximum allowable gain before feedback occurs is reached or exceeded, the gain is manipulated for an offending frequency range.

By such a method the above mentioned drawbacks of the previously known methods are remedied and the feedback management may be adjusted individually for the actual user.

In a further embodiment the determining of the maximum gain before feedback occurs and the controlling the volume control is applied for several channels.

By using a multi channel type of filter it is possible by proper selection of the crossover frequencies to use the same type of filter for both feedback and adaption purposes. Using the same filter for both purposes reduces the size of the amplifier and to some extent also the cost of the amplifier.

A 1st or preferably higher order multi channel filter can be used for feedback management and adaptation purposes. This filter has shown to possess adequate properties for the purpose of the method according to the invention.

According to the invention the hearing aid comprises a housing containing a microphone, an amplifier in connection with the microphone, a receiver in

connection with the amplifier, where the amplifier comprises a multi channel type of filter, a control system for monitoring the gain in at least one channel, and control means for controlling the volume control in the at least one channel.

In a further embodiment the determining of the maximum gain before feedback occurs and the controlling the volume control is applied for several channels.

In a preferred embodiment the multi channel filter is adapted for both feedback management and adaptation purposes.

The invention will be explained more detailed in the following with reference to the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1-2 are drawings showing the function of a method according to the invention:

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the FIGS. 1 to 2 the multi channel filter has as an example been chosen to be a two channel type filter along with a suitable crossover frequency.

From FIG. 1 a situation appears where the feedback management has been disabled and the volume control functions in a conventional manner. The volume control comprise in this example 15 steps, each step defining a 2 dB increase or decrease of gain. All frequencies are subjected to the same increase or decrease of gain depending on the setting of the volume control.

From FIG. 2 a situation appears, where the maximum allowable gain in the high frequency channel before feedback occurs has been determined to volume control (VC) setting –12 dB. If the user exceeds this setting of the volume control, the control system takes over and for example keeps the gain in the high frequency channel constant and allows only an increase in gain for the low frequency channel.

The number of channels, step size, the number of steps etc. may in this connection be chosen different from the above example.